June 2, 1936. R. L. WOOLES 2,043,025

METHOD OF MAKING ETCHED GLASSWARE

Filed July 28, 1933

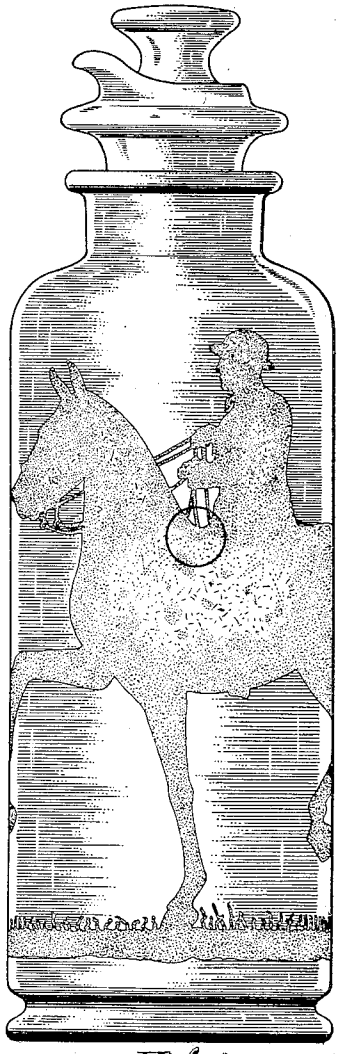


Fig. 1



Fig. 2

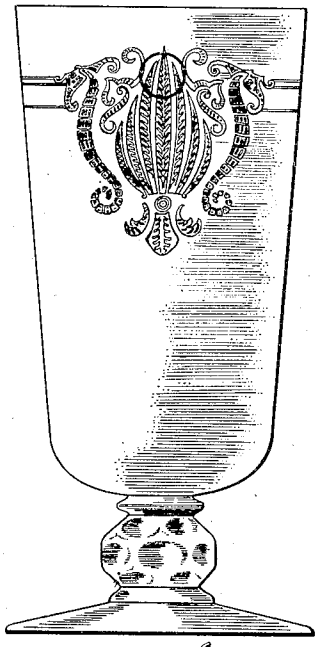


Fig. 3

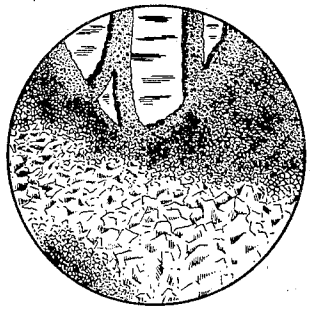


Fig. 4

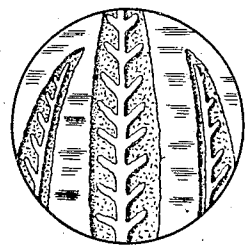


Fig. 5

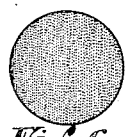


Fig. 6

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METHOD OF MAKING ETCHED GLASSWARE

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3 Claims. (Cl. 41—42)

My invention relates to etched glassware and method of making the same. It has to do particularly with the production of etched designs upon glassware in the formation of the outline for the design by the etching process itself rather than by molding, though it is not necessarily limited thereto.

In the prior art, various methods have been utilized for etching articles of glassware. One common method is to apply beeswax coating to the entire article and then remove certain parts of the beeswax by means of a mechanically actuated needle which inscribes a predetermined design and which leaves the glass at the point of removal subject to attack of the etching acid upon dipping of the article therein. This method is subject to rather severe limitations because of the mechanical difficulties in the production of any great number of different designs and because of the stereotyped nature of the designs that can be produced thereby.

Another prior art method that has been used to a considerable extent consists in the photographing of a given design upon a sensitized metal plate, the etching of this metal plate to develop the design in relief thereon and the subsequent use of this plate for the making of acid-resist patterns. These patterns are produced by coating the metal plate with the acid-resist which is generally black and then applying a strip or sheet of paper to the coated plate so that the paper will be rather heavily coated with the black acid-resist and the design will be formed in the coating of acid-resist. The pattern is then applied to the article of glassware and the material is such that the paper may be moistened and removed so as to leave the acid-resist on the glassware with the preselected design appearing therein. The glass article is then covered fully with the acid-resist, with the exception of the design area.

At this stage in the operation, the article is ordinarily dipped into a 60% solution of hydrofluoric acid mixed with from two and one-half to three parts of water. The usual period of immersion is from fifteen to twenty minutes. The only type of etching ordinarily considered feasible with this process in the past has been what may be termed a line etching wherein a design is produced in the glassware by a series of relatively thin lines along which this comparatively weak acid has operated to etch the glass. With this type of etching, the acid, being more or less concentrated along sharply defined narrow lines, produces what appears under the microscope to be a series of definite channels with comparatively abrupt sides. To the normal vision, the lines which go to make up such an etching appear quite similar to those lines which result from the process wherein the design is inscribed upon the beeswax coated by the mechanically actuated needle.

Another prior art process commonly used in etching glass is known as matt etching. In performing this process, the glass is usually subjected to a weak acid for a short length of time in order to produce the matt surface on the glass. This matt surface comprises a surface which is frosted in nature and which is of substantially uniform characteristics throughout its area. This frosted surface usually does not possess a very high degree of transparency and the entire frosted area has substantially the same degree of transparency.

Some effort has been made to produce what may be termed a silhouette etching by forming a selected design in an article of glassware during the molding thereof and then covering this design with an etching acid to give it a more or less frosted appearance. Generally, in this method, it is customary to provide the base or a wall of the mold with a design in relief so that the pressing of the glass in the mold reproduces an indented design in the glass article. Then, this indented design is ordinarily subjected to a weak acid for a moment or two so that this surface is given a slightly frosted and comparatively glossy appearance. Frequently, the area surrounding the design must be ground and polished to complete the article.

My method contemplates the making of a silhouette etching upon glassware and the production of this silhouette without the use of a molding process. Instead of molding the design into the article, the exterior outline of the design is delineated by the interior outline of an acid-resisting material which is preferably black and which entirely covers the article with the exception of the area or areas which are to be etched. With the article so covered by the acid-resisting material, it is dipped into an acid of such a strength and for such a period of application as to effect an etching of the design area and to thereby produce a silhouette design upon the glass which is rough and glassy in its nature, which is of uneven depth throughout and which possesses various degrees of transparency at various points in its area, as will be more fully explained later.

Samples of articles produced by my method

and by prior art methods are illustrated in the accompanying drawing wherein:

Figure 1 is a side elevation of a cocktail shaker with a silhouette etching produced thereon by my method.

Figure 2 is a side elevation of a beer mug with a silhouette etching produced thereon in accordance with my method.

Figure 3 is a side elevation of a footed tumbler with a line etching produced thereon by a prior art process.

Figure 4 is a magnified view of the surface indicated by the circle in Figure 1 illustrating the nature of the etched surface produced by my method.

Figure 5 is a magnified view of the surface indicated by the circle in Figure 3 illustrating the nature of the etched surface produced by the line-etching method of the prior art.

Figure 6 is a magnified view of a matt surface produced by a well known prior art matt-etching process.

Describing my process more specifically, it consists in the initial production of a design photographically upon a sensitized metal plate, followed by the etching of the design upon the plate by any suitable method and then by the removal of the sensitized surface and the use of the etched plate for the making of transfer sheets wherein the design is reproduced in an acid-resisting material. To accomplish this the etched metal plate is coated with the black acid-resisting material in fluid form and a thin paper sheet is applied thereto, with the result that the design in black and white is imprinted upon the paper with the white portions thereof representing the design and the black portions thereof representing the surrounding acid-resisting material.

The sheet thus printed is removed and wrapped about the glass article upon which the design is to be reproduced, with the acid-resisting material in contact with the glass. Then, the paper is washed off by a solution which will leave the acid-resisting material upon the glass with a design represented therein by uncovered portions of the glass surface. It is then desirable to apply such additional amounts of acid-resisting material to the glass article that it will be completely protected from the acid at all points with the exception of the design area.

The article which has thus been protected is, preferably, dipped into a solution made up of 2 parts of water and 1 part of 80% hydrofluoric acid. It is held in this solution for a period ranging from 45 to 60 minutes.

Apparently, due to the fact that the designs which I use are silhouettes and to the fact that a comparatively strong acid is used for a comparatively long time, the nature of the etched surface of the glass is quite different in appearance from prior art etched glass surfaces with which I am familiar. It is markedly different from those articles of etched glassware in which the design is produced by a plurality of lines. It is also markedly different from those etched surfaces produced by the well known matt-etching process.

In Figure 4, I have illustrated a microscopic view of an etched surface produced by my process. In Figure 5, I have illustrated a microscopic view of a line etching produced by the prior art method, and in Figure 6, I have illustrated a microscopic view of a matt-etched surface produced by a well known matt-etching process. A comparison of these three figures will clearly bring out the differences between a surface produced by my process and a surface produced by either of the two prior art processes.

As clearly shown in Figure 4, the surface produced by my method is provided throughout its area with a multiplicity of ridges interspersed with valleys or lowered portions. The surface produced by the prior art line-etching method illustrated in Figure 5 embodies comparatively wide, flat areas with distinct and definite channels or canals which are clearly delineated therein. The matt-etched surface illustrated in Figure 6 is merely frosted in nature and of uniform depth, being of substantially uniform characteristics throughout its area. The high portions of the surface produced by my process are substantially frosted in nature, though more rough than the usual matt etching, while the lower portions are clearer and possess a greater degree of transparency and the very deepest portions are substantially clear in nature and possess a very high degree of transparency. The prior art matt surface does not possess a very high degree of transparency, but the entire area thereof is frosted, being comparatively smooth and having substantially the same degree of transparency throughout its area.

In addition to the differences appearing under the microscope, marked differences also appear from a comparative examination of the three surfaces by normal vision. Thus, a glass surface etched in accordance with my invention shows a rough, glassy area which is devoid of lines but which is more heavily frosted in some places than in others and, in certain portions, is substantially clear. This gives the surface a pleasing appearance with various degrees of transparency throughout various portions of the area thereof. The deeper portions possess the greater degree of transparency and usually occur toward the center of the design. On the other hand, the glass surface etched in accordance with the said prior art line-etching method shows a multiplicity of distinct lineal depressions which are so related to each other as to produce the complete design. A matt surface produced by a prior art process also differs greatly in appearance from a surface produced by my process. Such a matt surface has a uniform appearance throughout its area which is frosted in nature and has the same degree of transparency throughout.

A comparison of the three surfaces by a sense of touch also shows that the prior art etched surfaces are clearly different in nature from an etched surface produced by my process. By touching a surface produced in accordance with my process, it will be apparent that the surface is of irregular depth, with apparent tendency toward deeper etching in the center of any silhouetted figure and with the thicker and more heavily frosted areas adjacent the edges of the figure. In fact, with some large silhouette figures, portions at the center thereof are sometimes entirely devoid of any frosting. With an article etched by the prior art line-etching process, the etching seems to be more or less uniform throughout. This is, also, true of a surface produced by the matt-etching process. Such a surface presents uniform characteristics throughout its area which may be readily noticed by the sense of touch.

The net result of these differences which arise from the production of silhouette etchings upon glassware by my process is that the silhouetted figures, though beneath the surrounding surface of the glass article, have an appearance of being

in relief. Moreover, the very lack of uniformity of elevation of the etched surfaces and, consequently, the lack of uniformity of transparency, presents a pleasing variety in effect not hitherto attainable by any process with which I am familiar.

As previously stated, the novel surface which I obtain by my process is apparently due to the fact that the designs are silhouettes having wide areas and that I use a comparatively strong acid for a comparatively long time. Apparently, after the article is placed in the acid, it reacts with the glass to produce insoluble salts which cling to the surface. These salts apparently do not deposit uniformly throughout the area of the uncovered portion of the glass which forms the silhouette figure. Consequently, the acid does not eat into the glass for a uniform depth throughout the design but will more readily eat into the glass where there is only a slight deposit of the insoluble salts or where the glass is entirely devoid of the salts. As previously stated, the acid usually eats more deeply into the glass toward the center of the silhouette figure and this is, apparently, due to the fact that the insoluble salts are more readily washed off at the center of the silhouette figure.

It is also possible to apply my process for the production of designs upon glass articles merely by painting the acid "resist" directly upon the article by means of a brush, leaving the unpainted surface free for subjection to the etching acid, with the design determined by the painting operation. After this step has been performed, it is merely necessary to dip the article into the hydrofluoric solution of the strength indicated and for the period of time indicated.

It will be seen from this that various other acid solutions may be utilized in the performance of my method for producing articles of the type indicated. Thus, it is probable that the hydrofluoric solution may be supplemented by a fluoride such as commonly used in matt etching. For example, potassium or ammonium fluoride may be used for this purpose. The periods of dipping and consequent subjection of glass to the acid may vary with the particular solution used for performing the etching operation. Likewise, a somewhat weaker solution of acid may be used for a longer period of time or a stronger solution of the acid may be used for a shorter period of time in obtaining the desired results by my process.

It will be seen from the description set forth above that I have provided a novel method of making etched articles of glassware which permits the formation of designs and figures materially different in character from the stereotyped designs commonly made by the production of a multiplicity of depressed lines which, by their particular arrangement, produce the design sought and which are, also, noticeably different in character from prior art matt etchings. The method which I utilize for producing silhouette etchings in glassware dispenses with the necessity of producing the silhouette figure to be etched by molding it into the glassware and then applying the acid to the depressed surface so formed. This prior art method involves additional and costly steps of operation, such as the preparation of a mold with protuberances thereon and which frequently necessitates the grinding and polishing of the surface surrounding the etched area after the etching operation has been completed, none of these steps being necessary in the performance of my method.

It will also be seen that I have produced a novel article of glassware. As distinguished from the prior art, it may be termed a glass article embodying a design produced thereon by etching and having the silhouette etched to different depths at different areas thereof and, consequently, having portions thereof of varying degrees of transparency.

In this specification, I have described my process as being used for producing designs on transparent glass. Obviously, it might also be used on glass which is not transparent but is translucent. Therefore, by the term "transparent" which I use in the specification and claims, I intend to cover both "transparent" and "translucent."

Having thus described my invention, what I claim is:

1. The method of etching glassware which comprises applying upon a glass article an acid resist interrupted by an area of selected design to form a silhouette and applying to such area an acid solution of 2 parts of water and 1 part 80% soluton of hydrofluoric acd for a period ranging from 45 to 60 minutes.

2. The method of etching glassware which comprises applying upon a glass article an acid resist interrupted by an area of selected design, and applying to such area an acid solution of 2 parts of water and 1 part 80% solution of hydrofluoric acid for a period ranging from 45 to 60 minutes.

3. The method of etching glassware which comprises applying upon a glass article an acid resist interrupted by an area of selected design to form a silhouette, dipping said article in a bath of an acid solution comprising 2 parts of water and 1 part 80% solution of hydrofluoric acid and allowing the article to remain therein for a period ranging from 45 to 60 minutes so as to produce a rough etched surface of different elevations, the portions toward the center of the silhouette design having the lowest elevations.

RONALD L. WOOLES.